ascribe an origin different from that assigned by Dr. Young. In order to obtain a more distinct view of these colours, Sir David Brewster employed, instead of the substances used by Dr. Young, the white of an egg, beat up into froth, and pressed into a thin film between plates of glass. From observations of the colours exhibited by plates so prepared, and also by the edge of a thin film of nacrite in contact with copaivi balsam, the author deduces the conclusion, that all these phenomena, as well as those often seen in certain specimens of mica through which titanium is disseminated, and also in sulphate of lime, are cases of diffraction, where the light is obstructed by the edges of very thin transparent plates placed in a medium of different refractive power. If the plate were opake, the fringes produced would be of the same kind as those often noticed, and which are explained on the principle of interference; but, owing to the transparency of the plate, fringes are produced within its shadow; and, owing to the thinness of the plate, the light transmitted through it is retarded, and, interfering with the partial waves which pass through the plate, and with those which pass beyond the diffracting edge with undiminished velocity, modify the usual system of fringes in the manner described by the author in the present paper.

"Of such Ellipsoids, consisting of homogeneous Matter, as are capable of having the Resultant of the Attraction of the Mass upon a Particle in the Surface, and a Centrifugal Force caused by revolving about one of the Axes, made perpendicular to the Surface." By James Ivory, K.H., M.A., F.R.S. L. and Ed., Inst. Reg. Sc., Paris, Corresp. et Reg. Sc. Gotting. Corresp.

Lagrange, who has considered the problem of the attractions of homogeneous ellipsoids in all its generality, and has given the true equations from which its solution must be derived, inferred from them that a homogeneous planet cannot be in equilibrium unless it has a figure of revolution. But M. Jacobi has proved that an equilibrium is possible in some ellipsoids of which the three axes are unequal and have a certain relation to one another. His transcendental equations, however, although adapted to numerical computation on particular suppositions, still leave the most interesting points of the problem unexplored.

The author of the present paper points out the following property as being characteristic of all spheroids with which an equilibrium is possible on the supposition of a centrifugal force. From any point in the surface of the ellipsoid draw a perpendicular to the least axis, and likewise a line at right angles to the surface: if the plane passing through these two lines contain the resultant of the attractions of all the particles of the spheroid upon the point in the surface, the equilibrium will be possible, otherwise it will not. For the resultant of the centrifugal force and the attraction of the mass must be a force perpendicular to the surface of the ellipsoid, which requires that the directions of the three forces shall be contained in

one plane. This determination obviously comprehends all spheroids of revolution; but, on account of the complicated nature of the attractive force, it is difficult to deduce from it whether an equilibrium be possible or not in spheroids of three unequal axes, a problem which is unconnected with the physical conditions of equilibrium, and which is a purely geometrical question respecting a property of certain ellipsoids.

The author then enters into an analytical investigation, from which he deduces the fundamental equation

$$B - \frac{A}{1 + \lambda^2} = C - \frac{A}{1 + \lambda'^2} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1.)$$

the three axes of the ellipsoid being

$$k, \quad k\sqrt{(1 + \lambda)}, \quad k\sqrt{(1 + \lambda'^2)},$$

and A, B, C, constants, afterwards expressed by certain definite integrals. He then remarks that every ellipsoid which verifies this formula is capable of an equilibrium when it is made to revolve with a proper angular velocity about the least axis; for, in this case, the centrifugal force will be represented in quantity and direction by a line such that the resultant of this force and the whole attraction of the ellipsoid upon a point in the surface will be perpendicular to the surface. Lagrange had concluded that the equation (1), which results immediately from his investigations, admits of solution only in spheroids of revolution, that is when $\lambda = \lambda'$ and $B = C$; but by expressing the functions A, B, C in elliptic integrals, M. Jacobi has found that the equation may be solved when the three axes have a particular relation to one another. In order to ascertain the precise limits within which this extension of the problem is possible, and to determine the ellipsoid when the centrifugal force is given, the author has recourse to the equations of Lagrange, which contain all the necessary conditions, and he deduces the equations

$$f = B - \frac{A}{1 + \lambda^2}, \quad f = C - \frac{A}{1 + \lambda'^2}, \quad . \quad . \quad . \quad (2.)$$

where f represents the intensity of the centrifugal force at the distance equal to unity from the axis of rotation, and remarks that these equations coincide with the equations of Lagrange. Substituting for A, B, C certain definite integrals given in the *Mécanique Celeste*, he deduces three equations expressing the value of g, the ratio of the intensity of the centrifugal to that of the attractive force, one of these being expressed in terms of the density and the other two in the form of definite integrals; and then remarks that "these equations comprehend all ellipsoids that are susceptible of equilibrium on the supposition of a centrifugal force."

He then applies these equations to the more simple case of the spheroid of revolution, where $\lambda = \lambda' = l$, and determines the value of l

$$l = 2{\cdot}5293,$$

and the corresponding maximum value of $g = 0{\cdot}3370$, and remarks that, "with respect to spheroids of revolution, it thus appears that an equilibrium is impossible when g, or its value in terms of the density, is greater than $0{\cdot}3370$. In the extreme case, when g is equal to $0{\cdot}3370$, there is only one form of equilibrium, the axes of the spheroid being

$$k \text{ and } k\sqrt{\{1 + (2{\cdot}5293)^2\}} \text{ or } 2{\cdot}7197\, k;$$

but when g is less than $0{\cdot}3370$ there are two different forms of equilibrium, the equatorial radius of the one being less, and of the other greater than $2{\cdot}7197\, k$, k being the semi-axis of rotation.

The number of the forms of equilibrium in spheroids of revolution, he remarks, is purely a mathematical deduction from the expression of the ratio of the centrifugal to the attractive forces; and as this has been known since the time of Maclaurin, the discussion of it was all that was wanted for perfecting this part of the theory.

Returning to the general equations of the problem, the author deduces the equations

$$g = \frac{d\phi}{dp} p$$

$$o = \frac{d\phi}{\tau\, d\tau},$$

where ϕ is a definite integral, such that

$$g = \frac{d\phi}{d\lambda} \cdot \lambda, \quad g = \frac{d\phi'}{d\lambda'}.$$

$$p = \lambda\lambda' \text{ and } \tau^2 = (\lambda - \lambda')^2,$$

which equations apply exclusively to ellipsoids with three unequal axes, and solve the problem with regard to that class. From these he derives another equation, which he states is no other than a transformation of his first fundamental equation, and is equivalent to other transformations of the same equation found by M. Jacobi and M. Liouville.

He also remarks that a limitation of one of the constants, which the verification of this formula requires, agrees with the limitation of M. Jacobi; and further, that the relations which may subsist between the constants proves that there does exist an infinite number of ellipsoids not of revolution, which are susceptible of an equilibrium.

After determining the corresponding limits of these relations of the constants, p being contained between the limits $1{\cdot}9414$ and 1, while τ^2 increases from zero to infinity, he remarks that an elliptical spheroid formed of a homogeneous fluid can be in equilibrium by the action of a centrifugal force only when it revolves about the least axis.

He next deduces the general value of g (the ratio of the forces), and thence its value in one extreme case, when $\tau^2 = 0$ or when

λ and λ' are equal, and remarks that this is no other than the determination of g in a spheroid of revolution having its axes equal to

$$k \text{ and } k\sqrt{2{\cdot}9414} = k \times 1{\cdot}7150.$$

In the other extreme case, when τ^2 is infinitely great, g is zero,

From this investigation the conclusion is arrived at, that for every given value of τ^2 there is only one value of p, and only one ellipsoid; and that to every such ellipsoid there is an appropriate value of g: and, further, that for every possible value of g there will be only one value of τ^2, and consequently only one ellipsoid susceptible of an equilibrium.

Also the reading of a paper, entitled, "Experimental Researches in Electricity." Eleventh series. By M. Faraday, Esq., D.C.L., F.R.S., Fullerian Professor of Chemistry at the Royal Institution, was commenced.

December 21, 1837.

FRANCIS BAILY, Esq., Vice-President and Treasurer, in the Chair.

The reading of Mr. Faraday's eleventh series of Experimental Researches in Electricity was resumed, but not concluded.

The Society then adjourned over the Christmas vacation to meet again on the 11th of January next.

January 11, 1838.

JOHN GEORGE CHILDREN, Esq., Vice-President, in the Chair.

The ballot for Bryan Donkin, Esq., was postponed in consequence of the number of Fellows required by the Statutes not being present.

The reading of a paper, entitled "Experimental Researches in Electricity," Eleventh Series, by Michael Faraday, Esq., D.C.L., F.R.S., Fullerian Professor of Chemistry at the Royal Institution, &c., was resumed and concluded.

The object of this paper is to establish two general principles relating to the theory of electricity, which appear to be of great importance; first, that induction is in all cases the result of the actions of contiguous particles; and secondly, that different insulators have different inductive capacities.

The class of phænomena usually arranged under the head of *induction* are reducible to a general fact, the existence of which we may recognise in all electrical phænomena whatsoever; and they involve the operation of a principle having all the characters of a first, essential and fundamental law. The discovery which he had already made of the law by which electrolytes refuse to yield their elements to a current when in the solid state, though they give them forth freely when liquid, suggested to the author the extension of analogous explanations with regard to inductive action, and the possible reduction